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with belladonna might be advantageous at the beginning of the disease. Mild and non-irritating articles of food only should be given, such as oil cake, etc. A veterinarian in Garden City recommended the application of a blister behind the ear. This might be good, as also any counter-irritant application along the spine. I am especially indebted for these conclusions and much assistance in making up this report, to Dr. Harding (above referred to), and Dr. Budd Smith, of Grenada, Col.

This examination, while it is very interesting, does not form a basis for any very positive conclusions. It will be necessary, to continue the investigation, to perform a number of like operations. It is very desirable to repeat the experiment of Dr. Harding—all of which the writer is preparing to do as soon as he is able.

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### ON THE VARIATIONS IN THE SUGAR-CONTENT OF *SORGHUM VULGARE*.

BY J. T. WILLARD.

Individual specimens of all species of plants may be assumed to vary in composition between certain limits. When the variable constituent is a substance of value to man, a determination of the causes of variation and its degree, becomes of importance. Further, we might reasonably hope that, by selecting seed from plants containing the largest percentage of the valuable constituent, the amount might be gradually but permanently increased. This system of seed selection is, of course, commonly practiced, and many of our best varieties of cultivated plants have been produced in this way. But, so far as the writer has been able to ascertain, this system has never been applied to sorghum by saving seed from plants which show by analysis a larger percentage of sugar than the average.

There are some difficulties in the way of improving sorghum by this method. The ordinary farmer cannot apply it, because he has no means of determining the sugar-content of his stalks of cane unless he has a chemist at command. The officials of the Department of Agriculture have never attempted anything of the kind, perhaps because it would require several years of observation before anything definite could be ascertained, and they, like the rest of mankind, desire immediate results, and have little object in inaugurating a series of experiments only to see a successor come in and either take all the credit or drop the work.

The plan of the experiment to be described was this: Kansas Orange sorghum was selected as the variety at present best for this State. By individual analysis of a number of stalks of a size and proportion suitable for perpetuation, I expected to determine if there were any appreciable variations in their sugar-content; then by planting seed from the best stalk, all things considered, I hoped to be able to fix the good qualities of this stalk. It might also be expected that the plants produced by seed from this stalk would exhibit variations in their sugar-content, and that by again planting seed from the best stalk the average might be raised still higher. By continuing in this way a number of years, it seemed possible to so increase the percentage of sugar in sorghum as to make it a much more valuable plant.

The experiment was begun in the spring of 1885, by planting a small amount of Kansas Orange sorghum seed. The soil was in fair condition only. The seed was poor, so that replanting was necessary, making the crop late. The season was, on the whole, rather favorable to the growth of the plant, although it was injured somewhat by drouth. Ten analyses connected with this experiment were made, all after the seed was dry and hard. One of these was of a bent stalk, and the result showed it

to be so inferior to the others that it will not be considered further in making comparisons. The following table shows in detail the analyses of the nine other stalks:

ANALYSES OF SINGLE STALKS OF SORGHUM, 1885.

Number.	Height in inches.....	Weight in pounds.....	Weight of juice extracted.....	Per cent. of juice.....	Polarization.....	Specific gravity.....	Per cent. of sucrose in juice.....	Per cent. of reducing sugar in juice.....
1.....	75	1.538	.796	51.7	40.00	1.0563	9.85	2.23
2.....	72	1.470	.708	48.1	64.50	1.0811	15.53	1.06
3.....	73	1.104	.534	48.3	57.30	1.0737	13.84	2.09
4.....	65	1.064	.523	49.1	50.10	1.0669	12.11	2.10
5.....	73	1.347	.652	48.4	55.90	1.0743	13.50	1.91
6.....	74	1.305	.646	49.5	54.50	1.0725	13.25	2.09
7.....	61	1.026	.435	42.3	59.30	1.0838	14.48	2.85
8.....	66	.944	.430	45.5	66.40	1.0808	15.84	1.25
9.....	68	1.133	.563	49.7	41.20	1.0665	12.51	1.73
Average.....					54.35		13.43	1.92
Maximum.....					66.40		15.84	2.85
Minimum.....					40.00		9.85	1.25

It may be seen from the above table, that there is a wide variation in the composition of the juice from the different canes. All the stalks were straight, upright, and apparently healthy. They were weighed and measured with the leaves and upper joint removed. The saccharimeter used is of the Soleil-Scheibler pattern, and the reducing sugar was determined by Soxhlet's modification of the Fehling method.

The seed from number two was saved, as that stalk seemed best, all things considered, notwithstanding number eight had a slightly higher percentage of sucrose. Seed from this stalk was planted in the spring of 1886. It germinated well; the ground was in excellent condition, and the crop grew vigorously, many stalks standing over ten feet in height. The protracted drouth of August and September injured it badly, however, over one-third of the leaves being killed. Other analyses made by the writer have plainly showed that this killing of the leaves of the plant injures the quality of the juice in a marked degree. Twelve partial analyses were made. Owing to a press of work, the analyses were not as complete as those of the year before, in most cases only the polarization of the juice being determined. The stalks showing extreme results were fully analyzed. The average polarization was 56.33. The best stalk was 76 inches in height, weighed 1.867 pounds, and yielded 50.3 per cent. of juice, of specific gravity 1.08156, and containing 15.73 per cent. of sucrose and 1.89 per cent. of reducing sugar. The juice polarized 65.52. By comparing this with the stalk from which seed was planted, it will be seen that there is a considerable increase in the size and weight, a slight increase in the specific gravity of the juice, a slight increase in the per cent. of sucrose, and a greater increase in the per cent. of reducing sugar. The results, while showing no marked improvement, are encouraging, in that they show that cane grown from the selected seed was more than able to hold its own in an exceptionably unfavorable season. To what extent the improved condition of the soil is to be credited, is a matter which cannot be determined. The results are not regarded as conclusive, and the experiment will be continued in the future as long as it seems profitable, if opportunity permits.